

The effects of different degrees of head-of-bed elevation on the respiratory pattern and drainage following thyroidectomy: a randomized controlled trial

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Abstract

Background: The patient's position is important for ensuring patient comfort and preventing complications after thyroidectomy.

Objectives: This study was carried out to determine the effects of different degrees of head-of-bed elevation (HOBE) on the respiratory pattern and drainage following thyroidectomy and to provide suggestions for evidence-based clinical practice.

Methods: The sample of this prospective, parallel arm, randomized controlled trial included 114 patients undergoing thyroidectomy in a university hospital in Turkey. The patients were randomly assigned (1:1:1) to supine 0° (baseline), 30° and 45° HOBE groups. Respiratory pattern including respiratory rate (RR), peripheral oxygen saturation (SpO₂) and dyspnea, and drainage including amount of drainage and hematoma formation were evaluated at the 1st, 2nd, 3rd and 4th hours following thyroidectomy.

Results: The majority of the patients (83.3%) were female and 84.2% had undergone total thyroidectomy. The mean RR (18.47, 95% CI=17.85-19.09) of the patients in the supine 30° HOBE group at the 1st hour was significantly higher than that of the patients in the supine 0° group (17.32, 95% CI=16.88-17.76; $p<0.05$). There was no significant difference between the SpO₂ values of the patients in the groups ($p>0.05$). The amount of drainage was significantly higher in the supine 0° group at the 2nd hour than that of the patients in the supine 45° HOBE group (5.92 ± 5.18 ; 3.34 ± 5.56 respectively; $p<0.05$). None of the patients in the groups had hematoma formation. While no patient in the supine 30° HOBE group had dyspnea, dyspnea occurred in 9 patients in the supine 0° group and in 3 patients in the supine 45° HOBE group.

Conclusion: This study showed that different HOBE positions resulted in clinically insignificant changes on the RR and amount of drainage during the first 4 hours following thyroidectomy but did not affect SpO₂ value.

Keywords: Head-of-bed elevation, thyroidectomy, controlled trial.

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Introduction

Thyroidectomy is a safe surgical procedure commonly used for the treatment of benign or malignant tumors, multinodular goiter and Graves disease.¹⁻³ However, because of the rich vascular structure of the thyroid gland, serious complications including hemorrhage,

hematoma and hematoma-related dyspnea can develop after thyroidectomy.^{1,4-6}

There are many studies in the literature addressing the causes, preventive interventions and treatment of complications such as hemorrhage, hematoma and respiratory problems in patients after thyroidectomy.^{4,7-13} Some of these studies investigated the effects of positions such as semi-Fowler's position, beach chair, partial trendelenburg or flat supine and valsalva maneuver on bleeding control and prevention of hematoma.¹⁰⁻¹² A previous study showed that patients should be placed in a semi-Fowler's position to achieve bleeding control after thyroidectomy, however, but it did not examine efficacy of position on bleeding control.¹⁰ A review suggested that the head of bed should be elevated at 30-45 degrees after thyroidectomy in order to prevent the formation of airway obstruction in the patient caused by laryngeal edema due to surgical manipulation.¹⁴ The American Thyroid Association also recommended to keep the patient in a head-up at 45°-Fowler's position in the post anesthesia care unit following thyroidectomy to prevent hematoma formation on the incision site by facilitating venous return from the head and neck.¹¹ The mentioned guideline does not offer any recommendations regarding the position that should be given to the patients at surgical clinic after thyroidectomy.

As the position of the body affects oxygenation,^{15,16,17} hemodynamics such as heart rate, systolic and diastolic blood pressure,^{15,18} the effect of the position given to patients is important. In the early period following thyroidectomy, patients are given supine 0° (especially those with low blood pressure), 30° and 45° HOBE positions in surgical care units, but there are currently no research findings on the effect of these positions on patients with thyroidectomy. The existing studies about these positions showed that supine position decreases systolic blood pressure in hypertensive individuals¹⁷ and decreases lung function in healthy adults,^{19,20} abdominal surgical patients,¹⁷ and cardiac surgery patients undergoing mechanical ventilation (MV)¹⁶ and that 30° and 45° HOBE positions improves lung function. In a similar study, it was determined that supine position reduced breathing frequency.²¹

Following thyroidectomy, giving the appropriate position to the patient by the nurse and closely monitoring the patient's breathing and amount of drainage are important for early detection of complications such as bleeding and breathing problems.^{14,22} Therefore, this

study aimed to identify the effects of different degrees of HOBE on respiratory pattern and drainage of patients following thyroidectomy, and to provide evidence-based suggestions for nurses.

Methods

Study design and setting

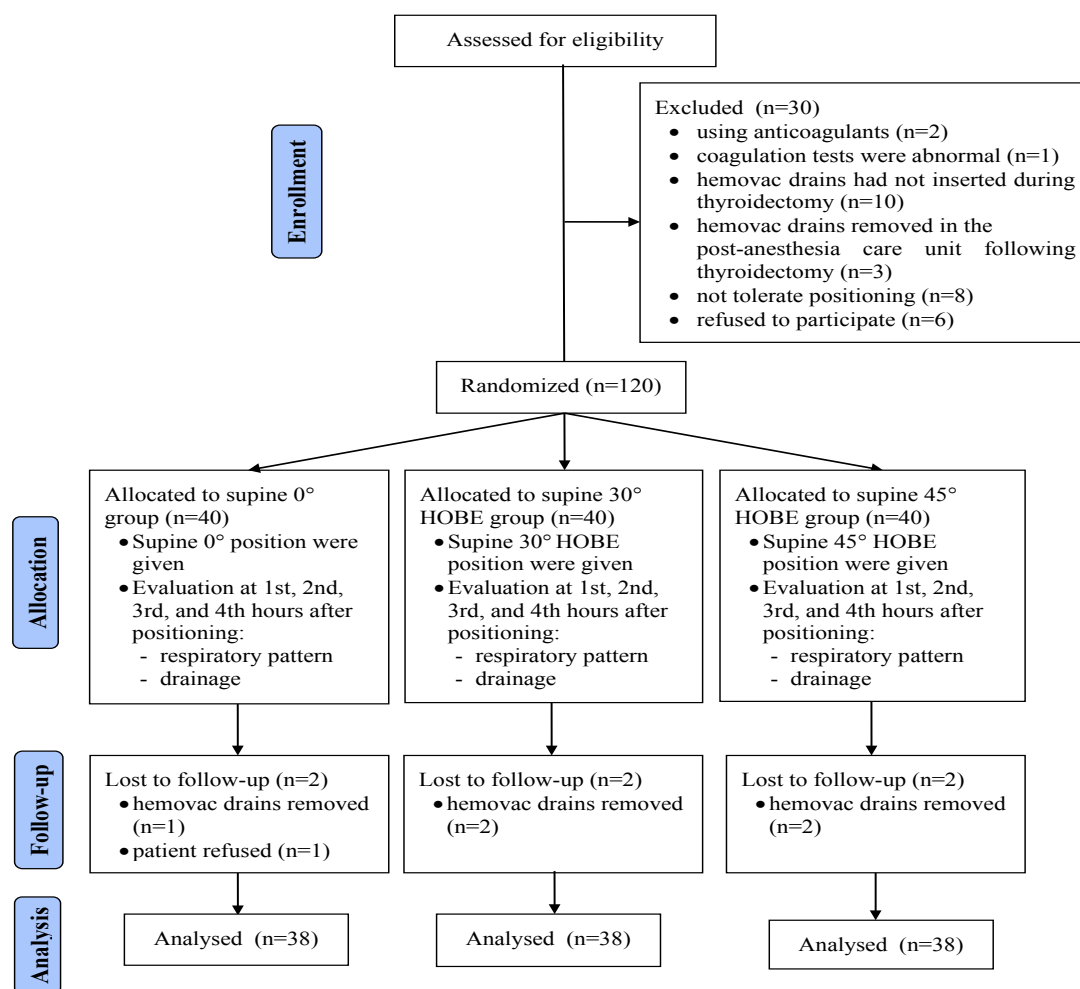
This study was conducted as a prospective, single-center, parallel, three arm [1:1:1], randomized controlled trial at the Endocrine Surgery Clinic of a university hospital in Istanbul, Turkey between May 1, and September 30, 2013. Located in Istanbul, the largest city in Turkey, the Endocrine Surgery Clinic, where the study was conducted, is a center where patients with thyroid, parathyroid and adrenal glands disorders from many parts of Turkey seek treatment. On a monthly average, 40 thyroidectomy operations are performed in this center with 19 beds.

This trial was registered with ClinicalTrials.gov (ID NCT03816371) and approved by the Istanbul University Cerrahpaşa Medicine Faculty Clinical Researches Ethics Committee (Number/date: 3029/2013). The participants were informed that their participation was based on voluntariness before surgery. Finally, written and oral permissions were obtained from all the patients who participated in the study.

Participants

The study population consisted of 150 patients aged 18 years and older who underwent total thyroidectomy at the Endocrine Surgery Clinic between May 1, and September 30, 2013.

None of the patients had any mental disorder that interfered with communication. The eligible participants were those who were not using anticoagulants, whose coagulation tests were normal, who had hemovac drains inserted during thyroidectomy, who had no contraindication to positioning (e.g., heart failure, chronic obstructive pulmonary disease, dyspnea before surgery and respiratory complications in the post-anesthesia care unit), who could tolerate positioning, and who volunteered to participate and signed the informed consent form. The participants who were using anticoagulants, whose coagulation tests were abnormal, who had hemovac drains inserted during thyroidectomy, who had hemovac drains removed in the post-anesthesia care unit following thyroidectomy, who did not tolerate positioning and who refused to participate were excluded from the study (Figure 1).



HOBE: head-of-bed elevation

Figure 1: CONSORT flow diagram for this trial

All the patients were evaluated before and after thyroidectomy in terms of the inclusion and exclusion criteria by the two surgeons and one anesthesia physician in the study, who were not aware of which participant had been assigned to which group. As a result of this evaluation, 30 patients were excluded from the study. Also, five patients who had hemovac drains removed and one patient who refused the position were excluded from the study during the follow-up (Figure 1).

Procedures

The eligible patients transferred to the ward from the operating theatre following thyroidectomy were randomly assigned to the experimental groups (supine 30° HOBE and supine 45° HOBE) and the control group (baseline: supine 0° group) by the clinical nurse in the study. The degree of HOBE was arranged by the same nurse as soon as the patient was admitted to the bed. The HOBE degrees were measured using goniometer.

Data concerning the patients' socio-demographic and clinical characteristics were collected using a data collection form developed based on the relevant literature^{8-10,14,15,22-26} by the researchers.

Respiratory pattern including respiratory rate (RR), peripheral oxygen saturation (SpO₂) and dyspnea, and drainage including amount of drainage and hematoma formation of all patients were evaluated at 1st, 2nd, 3rd, and 4th hours (Figure 1).

No patient required termination from the study due to adverse events associated with positions.

Outcome measures

The primary outcome measures of this study were RR, SpO₂, and amount of drainage.

Respiration rate was counted for one minute²⁷ by the clinical nurse in the study. SpO₂ was measured with pulse oximeter (Covidien nellcor-08787, Kalimed Medikal, Ankara, Turkey) and the amount of drainage in the hemovac drain suction bottle was recorded by the clinical nurse in the study. The amount of drainage was

used to evaluate postoperative hemorrhage (POH). The symptoms including red drainage, bleeding from incision and the accumulation of more than 150 ml per hour drainage in the suction bottle were defined as POH.^{9,26}

The secondary outcome measures of this study were dyspnea and hematoma formation.

Dyspnea is defined as “a subjective experience by individuals who complain of unpleasant or uncomfortable respiratory sensations” in the consensus statement published by the American Thoracic Society in 1999.²⁸

Dyspnea was evaluated by the anesthesia physician in the study.

In this study, hematoma formation was evaluated by the surgeons in the study by monitoring warning signs such as progressive neck swelling, hypoxia, tachycardia, dyspnea and stridor.^{10,11}

Sample size

The effect size of the difference between the means of RR, SpO₂ and the amount of drainage to be obtained from the four repeated measures according to the three different positions (i.e., supine 0°, supine 30° HOBE and supine 45° HOBE) would be at least 0.25 (i.e., medium impact for variance test) with a two-sided type I (alpha) error rate of 0.05 and 80% power, the calculations performed in G*Power program showed that each of the groups should have at least 38 people (37.7) and there should be a total of 113 people. The study was completed with 114 patients.

Randomization and masking

The consenting, eligible patients were randomly assigned to the experimental groups or the control group according to their arrival sequence in blocks of three in a 1:1:1 ratio using the block randomization method. The randomization sequence was developed using a computer-generated table of random groups by a biostatistician who was not associated with the study.

Group allocation was concealed using individual sealed opaque envelopes that were numbered in sequential order. As individuals were enrolled in the study, the next envelope in the sequence was extracted and the participant was assigned to the groups accordingly. When the patient was transferred from the operating theatre to the ward, the clinical nurse in the study assigned the patient to one of the groups according to the list in the envelope and gave the corresponding position. All the researchers except for the clinical nurse who positioned the patients according to randomization list and patients were blinded from group assignment.

Data analysis

Continuous data were described using mean, standard deviation, and 95% confidence interval (CI) values, and categorical variables were analyzed using frequency and percentage. In the analysis of the data on the amount of drainage, the median and the first and third quartiles were given. Pearson's Chi-square test and one-way ANOVA were used to compare the similarity of the groups in terms of their baseline characteristics.

Also, parametric tests were used according to the Central Limit Theorem in the analysis of continuous data (RR and SpO₂ values).²⁹ Whether there was a difference in RR and SpO₂ between the groups was evaluated using the one-way ANOVA and post hoc test (Tukey HSD test). The repeated measures ANOVA and post hoc test (Bonferroni analysis) were used to determine the time-dependent change of RR and SpO₂ values measured at different times within the group.

Due to the presence of “0”, which is show that no drainage in drainage data, the type of drainage measure were accepted as ordinal rather than ratio and nonparametric tests were used in the analysis of drainage data. Kruskal Wallis H test and post hoc test (Dunn) were used to determine whether there was a difference in the amount of drainage between the groups. Friedman's 2-way test by ranks was used to determine the time-dependent change of the amount of drainage measured at different times within the group.

As there were few patients with dyspnea, no statistical evaluation could be performed between the groups. McNemar chi-square test statistic was used to determine the change in dyspnea formation within the group at different evaluation times. Data were presented using graphs.

The two side type 1 error rate was accepted maximum 5%. Statistical analyses were performed using E-picos software (www.e-picos.com, NY, New York) and MedCalc Statistical Software version 16.4.3 (MedCalc Software bvba, Ostend, Belgium; <https://www.medcalc.org>; 2016).

Results

Descriptive characteristics of patients

The study was completed with 114 patients (Figure 1). The mean age of the patients was 46.61 years (SD=15.26), most of them were female (83.3%) and 36% were overweight. More than half of the patients (69.3%) had a diagnosis of multinodular goiter. Most of the patients (84.2%) underwent total thyroidectomy. The mean surgical intervention time of the patients was 58.46 minutes (SD= 25.85) (Table 1).

Table 1: Descriptive characteristics of patients

Characteristics	Total	Supine 0° Group ¹ (n=38)	Groups Supine 30° HOBE Group ² (n=38)	Supine 45° HOBE Group ³ (n=38)	Test/p
Age, y, mean (SD)	46.61 (15.26)	44.82±14.93	48.42±16.61	46.58±14.33	0.526/ 0.59*
Gender, n (%)					
Female	95 (83.3)	31 (81.6)	31 (81.6)	33 (86.8)	0.505/ 0.78 ^ψ
Male	19 (16.7)	7 (18.4)	7 (18.4)	5 (13.2)	
Body mass index, (kg/m²) n (%)					
Normal (18.5-24.99)	38 (33.3)	13 (34.2)	12 (31.6)	13 (34.2)	1.087/ 0.90 ^ψ
Overweight (25.0-29.99)	41 (36.0)	13 (34.2)	16 (42.1)	12 (31.6)	
Obese (≥30)	35 (30.7)	12 (31.6)	10 (26.3)	13 (34.2)	
Diagnosis, n (%)					
Multinodular goiter	79 (69.3)	28 (73.7)	28 (73.7)	23 (60.5)	3.313 / 0.51 ^ψ
Graves' disease	10 (8.8)	3 (7.9)	4 (10.5)	3 (7.9)	
Thyroid cancer	25 (21.9)	7 (18.4)	6 (15.8)	12 (31.6)	
Type of thyroidectomy, n (%)					
Total	96 (84.2)	34 (89.5)	33 (86.8)	29 (76.3)	2.771/ 0.25 ^ψ
Subtotal	18 (15.8)	4 (10.5)	5 (13.2)	9 (23.7)	
Surgical intervention time, min., mean (SD)	58.46 (25.85)	61.03±28.47	61.18±24.63	53.16±24.12	1.202/ 0.31*

HOBE: head-of-bed elevation

* One-way ANOVA

^ψ Pearson's Chi-square test

The patients in the supine 0°, 30° and 45° HOBE groups were similar in terms of the descriptive characteristics including age, gender, body mass index (BMI), diagnosis, type of thyroidectomy and surgical intervention time ($p>0.05$; Table 1).

Effect of positions on outcome measures

Primary outcomes

Respiratory rate was between 16 and 20 breaths per minute in all the patients. In the comparison between the groups, the mean RR (18.47; 95% CI, 17.85-19.09) of the patients in the supine 30° HOBE group at 1st hour was significantly higher than that of the patients in the supine 0° group (17.32; 95% CI, 16.88-17.76) ($p=0.01$, Table 2).

In the in-group comparison according to the repeated measurements, the mean RR of the supine 0° group at the 4th hour (16.89; 95% CI, 16.53-17.26) was significantly lower than that at the 2nd hour (17.53; 95% CI, 17.08-17.97) ($p=0.03$, Table 2). The mean RR in the supine 30° HOBE group at the 1st hour (18.47; 95% CI,

17.85-19.09) was significantly higher than the measurements at the 2nd, 3rd and 4th hours ($p<0.001$, Table 2). The mean RR of the patients in the supine 45° HOBE group at the 1st hour (17.95; 95% CI, 17.39-18.51) was significantly higher than that at the 3rd hour (17.21; 95% CI, 16.74-17.68) ($p=0.009$, Table 2). SpO₂ values of all the patients were >95% and there was no significant difference between and within the groups ($p>0.05$, Table 2).

The amount of drainage was significantly higher in the supine 0° group at 2nd hour (5.92±5.18) than that of the patients in the supine 45° HOBE group (3.34±5.56) ($p=0.01$, Table 2). According to the repeated measurements within the group, the amount of drainage decreased significantly at the 2nd, 3rd and 4th hours in all the groups compared to the 1st hour ($p<0.001$, Table 2). In addition, the amount of drainage of the patients in the supine 30° HOBE group at the 3rd and 4th hours was significantly lower than that at the 2nd hour ($p<0.001$, Table 2). Moreover, the amount of drainage decreased in other groups at the 4th hour whereas there was an insignificant increase in the supine 0° group (Table 2).

Table 2: The effect of positions on primary outcomes of patients

Evaluation Time	Supine 0° Group ¹ (n=38)		Supine 30° HOBE Group ² (n=38)		Supine 45° HOBE Group ³ (n=38)		F/p [*]	Difference
	Mean±SD	95% CI	Mean±SD	95% CI	Mean±SD	95% CI		
Respiratory rate								
1st hour ^a	17.32±1.34	16.88-17.76	18.47±1.89	17.85-19.09	17.95±1.71	17.39-18.51	4.639/0.01	1<2
2nd hour ^b	17.53±1.35	17.08-17.97	17.89±1.86	17.28-18.51	17.68±1.89	17.06-18.31	0.44/0.65	
3rd hour ^c	17.37±1.15	16.99-17.75	17.63±1.91	17.00-18.26	17.21±1.44	16.74-17.68	0.734/0.48	
4th hour ^d	16.89±1.11	16.53-17.26	17.47±1.66	16.93-18.02	17.37±1.48	16.88-17.85	1.760/0.18	
F/p [†]	2.986/0.03		6.783/<0.001		4.080/0.009			
Difference	d<b		b,c,d<a		c<a			
Peripheral oxygen saturation								
1st hour ^a	96.29±2.51	95.46-97.12	95.95±2.60	95.09-96.80	96.24±1.95	95.60-96.88	0.229/0.80	
2nd hour ^b	96.55±2.09	95.87-97.24	95.61±2.58	94.76-96.45	95.89±1.67	95.34-96.44	1.941/0.15	
3rd hour ^c	96.29±2.17	95.58-97.00	96.18±2.32	95.42-96.95	96.24±1.76	95.66-96.82	0.024/0.98	
4th hour ^d	96.21±2.30	95.45-96.97	96.05±2.71	95.16-96.94	96.11±2.04	95.44-96.77	0.044/0.96	
F/p [†]	0.412/0.75		0.881/0.43		0.655/0.58			
Amount of drainage								
	Mean±SD	Median (Q1-Q3)	Mean±SD	Median (Q1-Q3)	Mean±SD	Median (Q1-Q3)	χ ² /p ^w	
1st hour ^a	7.39±4.53	9(3-12)	8.79±8.20	6(3-10.50)	7.03±6.31	6(0-10)	0.983/0.61	3<1
2nd hour ^b	5.92±5.18	6(1.5-9)	5.16±4.97	6(0-6.75)	3.34±5.56	0(0-6)	8.593/0.01	
3rd hour ^c	3.61±4.00	3(0-6.75)	3.92±5.56	3(0-6)	3.76±6.12	1(0-6)	0.484/0.79	
4th hour ^d	5.37±7.55	3(0-6)	3.47±4.58	3(0-6)	3.74±4.80	3(0-6)	1.439/0.49	
χ ² /p [‡]	20.798/<0.001		29.582/<0.001		31.601/<0.001			
Difference	b,c,d<a		b,c,d<a		b,c,d<a			
			c,d<b					

HOBE: head-of-bed elevation

^{*} One-way ANOVA

[†] Repeated Measures ANOVA

^w Kruskal Wallis H test

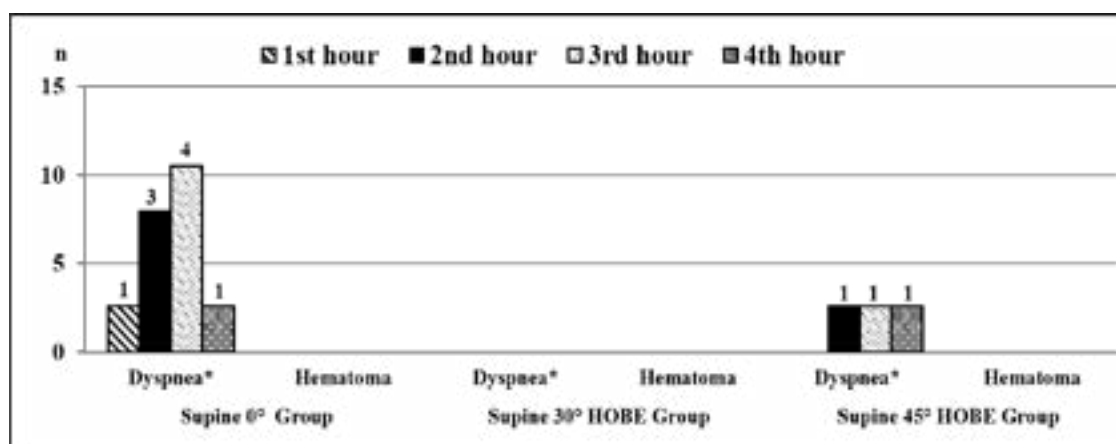
[‡] Friedman's 2-way test by ranks

Secondary outcomes

None of the patients had hematoma formation (Figure 2). None of the patients in the supine 30° HOBE group had dyspnea. Nine patients in the supine 0° group and 3 patients in the supine 45° HOBE group complained of dyspnea. The number of patients who had dyspnea

at 2nd hour (n=3) and 3rd hour (n=4) was more than in the supine 0° group (Figure 2).

In the in-group comparison according to four different evaluation times, there was no significant difference in terms of dyspnea formation in all groups (p>0.05, Figure 2).



* McNemar chi-square test statistic, p>0.05.

Figure 2: Secondary outcomes of patients

Discussion

The findings of this study contribute to the literature by providing evidence-based information on the effect of different positions given to patients after thyroidectomy on respiratory pattern and drainage. In the study, it was determined that supine 0° (baseline), 30° and 45° HOBE positions led to clinically insignificant differences on the RR and amount of drainage but did not affect SpO₂ value.

The normal RR interval for a healthy adult without breathing problems is 12-20 breaths per minute.²⁷ In this study, the RR of patients who were given supine 0° position at the 1st hour after thyroidectomy was significantly lower than those given 30° HOBE. However, this decrease was not clinically significant since all patients in the groups had a normal interval of RR (16-20 breaths per minute). In addition, statistically significant but clinically insignificant differences in RR values were determined in the repeated measurements within the group. On the other hand, there are currently no studies in the literature researching the effects of position on RR following thyroidectomy. The existing studies focus on the effect of HOBE and supine 0° positions on lung function such as functional residual capacity and vital capacity. In one of these studies, supine 30° HOBE was found to increase lung volume compared to supine 0° in cardiac surgery patients undergoing MV.¹⁶ Some other similar studies found that, when compared with supine 0°, 45° HOBE position increased vital capacity²⁰ and supine 0° position decreased breathing frequency 2.73 breaths/min on average.²¹ In the current study, we did not evaluate the effect of position on lung function. However, this study was the first to examine the effect of position on RR following thyroidectomy. The fact that patients with respiratory or heart diseases were not included in the current study may have caused position not to have a clinically significant effect on the RR. The research findings and the fact that RR is an independent risk factor for hospital mortality³⁰ indicates the need for further research on the effect of patient positions on RR following thyroidectomy.

Peripheral oxygen saturation, which is recommended to be >95% in critical care settings, is acknowledged to be the most sensitive sign of life in hospital mortality and admission to intensive care unit.³⁰ Therefore, it is important to determine whether SpO₂ is affected by the positions given to patients following thyroidectomy. In the current study, the SpO₂ value of the patients was 95% or higher, and the positions did not affect the SpO₂ value. There are currently no research findings showing

the effect of position on SpO₂ value in patients with thyroidectomy. In studies conducted with different patient groups, it was determined that supine 0° and supine 30° HOBE positions did not have a clinically significant effect on SpO₂ values in a similar way to the results of the current study.^{16,23} According to Benedik et al., it is difficult to detect the effect of very small changes in the partial oxygen pressure (PO₂) on SpO₂ by pulse oximetry.²³ Investigating the impact of these positions on oxygenation with new studies involving arterial blood gas analyzes is important since it will guide nurses to interpret small changes in SpO₂.

In order to monitor POH and prevent hematoma in the postoperative period, many surgeons place a closed suction drain in the thyroid bed at the end of thyroidectomy.^{24,31-34} The nurse should closely monitor the amount of drainage^{5,14,26} because one of the first signs and symptoms of POH is the accumulation of more than 150 ml per hour drainage in the suction bottle.⁹ Previous studies reported that the incidence of POH after thyroidectomy was 1-1.7%,^{3,5,9,10,33} and the incidence of hematoma causing fatal complications such as hypoxia and laryngopharyngeal edema varied in the range of 0-2.6%.^{2,4,8,32,35-37} In our study, none of the patients had POH or hematoma findings. One of the reasons may be the fact that the follow-up period was limited to 4 hours due to the mobilization of the patients after the 4th hour following thyroidectomy in the clinic where the study was conducted. This is because unlike the evidence suggest that the initial findings of POH are seen within the first 4 hours after thyroidectomy,³ there are also studies reporting that excessive drainage is seen within the first 6,^{9,11,34} or 8 hours²⁶ following thyroidectomy. Similar studies showed that hematoma occurs within the first 6 hours after thyroidectomy.^{4,7,8} Another reason for the absence of hematoma and POH in the current study may be that the risk factors such as male sex^{2,6-8,35,37}, thyroid cancer,^{2,3,35} Graves disease^{2,6,7} and subtotal thyroidectomy,^{2,35} which increase the risk of hematoma and POH, were low in our research groups. In addition, exclusion of the patients who were using anticoagulants and whose coagulation tests were abnormal from the current study might have been effective in the absence of hematoma and POH.

In this study, the amount of drainage of all patients in the groups decreased significantly over time compared to the first hour. However, the amount of drainage was higher in the patients in supine 0° group at the 2nd hour after thyroidectomy than in 45° HOBE group, which is important although not clinically significant because

there are currently no research findings about the effect of position on the amount of drainage. As there are no valves in the veins of the head and neck, lying flat position is known to increase venous pressure and cause soft tissue edema while HOBE decreases edema.³⁸ In the light of this, the increase in the amount of drainage in the supine 0° group in our study can be attributed to the greater drainage from the thyroidectomy bed due to increased venous pressure in this position. While a decrease was observed in all the other patients, it was noteworthy that there was an insignificant increase in the amount of drainage only in the supine 0° patients at the 4th hour. However, there are currently no research findings to confirm this result. Perhaps, this effect of supine 0° position can be demonstrated by future studies with longer follow-up durations.

In the current study, no dyspnea occurred in any of the patients in the 30° HOBE group. The patients with dyspnea were in the supine 0° (n=9) and 45° HOBE (n=3) groups. Previous studies reported that dyspnea was the result of hematoma-related airway compression after thyroidectomy and the incidence was 0.75-10.3%.^{3,24,31} In this study, dyspnea was not associated with hematoma or hemorrhage, and did not require intervention. In an observational study, risk factors such as giant goiter and malignant goiter were determined in patients experiencing respiratory problems after thyroidectomy.²⁵ When we examined the diagnosis of our patients with dyspnea based on that study, we determined that dyspnea developed in patients with multinodular goiter and thyroid cancer. Although our groups were similar to each other in terms of diagnostic features, it was noteworthy that dyspnea occurred in more patients in the supine 0° group. On the other hand, there are currently no research findings on the relationship between dyspnea formation and position after thyroidectomy. In this study, the cause of dyspnea in more patients in the supine 0° position group may be due to the fact that the increase in venous pressure in this position³⁸ may affect airway patency along with surgical surgeries caused by surgical manipulation.¹⁴

Limitations

This study has several limitations. One of the important limitations of this study is that the follow-up period was limited to 4 hours because patients due to the mobilization of the patients after the 4th hour following thyroidectomy in the clinic where the study was conducted. The short follow-up period might have prevented us from thoroughly evaluating the effects of positions on amount of drainage and hematoma because POH

and hematoma were found to develop within the first 6^{4,7-9,11,34} or 8 hours²⁶ after thyroidectomy. The effect of the position on the amount of drainage and hematoma formation could be clearly shown by future studies with a minimum follow-up period of 8 hours. The second limitation is the inability to measure functional residual capacity (FRC) or forced vital capacity (FVC). FRC or FVC were used to determine the effect of the position on respiration in studies with different patient groups.^{16,20} These measurements may provide a better understanding of the effect of different positions in the study on the respiratory pattern of patients with thyroidectomy. The third limitation is the value of oxygen saturation was measured by noninvasive pulse oximetry, not by invasive arterial blood gas, which directly showed the patient's oxygen saturation.²³ Lastly, we conducted the current study in single center with patients with different thyroid diseases. Previous studies found that the factors such as type of thyroid disease^{2,3,6,7,35} and type of thyroidectomy^{2,35} applied affected the amount of drainage, hematoma and dyspnea. Further studies with bigger samples of patients with these risk factors at different centers may provide a better understanding of the effect of position on the amount of drainage, hematoma, and dyspnea.

Conclusion

The results of this study showed that supine 0° (baseline), 30° and 45° HOBE positions given to patients during the first 4 hours after thyroidectomy did not affect the SpO₂ value of the patients. In the 1st hour, the RR of the patients in the supine 0° group was found to be significantly lower than that of the supine 30° HOBE group but this decrease was not clinically significant. None of the patients developed hematoma and no drainage was observed in any patient so much as to make us consider POH. However, at the 2nd hour, the amount of drainage in the supine 0° group was significantly higher than that of the supine 45° HOBE group. In addition, no patient had any dyspnea in the supine 30° HOBE group. Nine patients in the supine 0° group and 3 patients in the supine 45° HOBE group complained of dyspnea. These findings suggest that, even though American Thyroid Association recommends 45°-Fowler's position after thyroidectomy, the supine 0° and 30° HOBE positions can also be given during the first 4 hours following thyroidectomy.

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Conflict of interest

None declared.

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